

STUDY PURPOSE AND SCOPE

The purpose of this study is to consider the literature that looks at the implications of information technology for scholarly journals, which have historically been a linchpin of communication among scholars in which research results are released, discussed, vetted, and disseminated among faculty, students, and scholars. A broad range of researchers have discussed the implications of the information technologies in terms of the roles of the publishers, the ability of researchers to self-publish by posting materials to the World Wide Web, the economic and legal foundations of publishing, and the different ways that scholars can and will release their results.

Scholarly journal publishing, of which the scientific literature is a subset, is characterized by a successive, typically regular (e.g., monthly or quarterly), release of issues containing original scholarship. The material included in these publications is generally established through peer review (Page, Campbell, and Meadows 1997; Schauder 1994). The path to publication can be lengthy as research is verified, validated, revised, printed, and disseminated. In stark contrast to this slow and methodical approach is the rapid exchange of information facilitated by today's information technologies, particularly those subsumed by and associated with the Internet and the World Wide Web.

Not surprisingly, these technologies have, over the last 20 years, affected many aspects of traditional print publishing from manuscript preparation through submission, peer review, production, and distribution. On the one hand, these technologies answer to many limitations in the traditional scholarly journal publication process, overcoming, eradicating, or rendering moot issues related to timeliness, the advent of more subdisciplines and their attendant specialty publications, rising publication costs, and stressed library budgets. On the other hand, their effect on the quality and dissemination of scientific results is unclear.

SCIENTIFIC COMMUNICATION, INFORMATION TECHNOLOGIES, AND SCHOLARLY PUBLISHING

Over a quarter century ago, scholar Ben Russak (1975) noted that traditional models of scholarly communication would be undermined by the photocopy machine

and the computer. His prediction has held: the advent of new information technologies that have completely and irrevocably transformed the ways in which materials are created, structured, stored, transmitted, distributed, communicated, and accessed have similarly transformed the means and modes of scientific communication.

Scientists communicate in many ways—through formal and informal means, via the “visible” and “invisible” colleges,¹ at technical meetings and conferences, and around the coffee pot. Today's information technologies have created new vehicles for informal communication, including e-mail, listservs (automated e-mail discussion lists), and preprint archives.² These vehicles are being assimilated into the whole of the scientific communication system, a system aimed at affording “some measure of fairness and large amounts of skeptical testing of ideas and findings” (Griffiths 1990, p. 42).

It is, however, *published* communication that especially informs science, scientists, and scientific research. Indeed, one scholar notes that “scientific research is recognizable as such not because of the conditions under which it is performed but because of the way it is presented and published” (Pierce 1990, p. 55). And one key implication of the new information technologies has been to undermine the traditional notion of print “publishing”—which basically means to make material publicly available—without replacing it with a new definition (see CSTB 2000; also Arms 2000 and Kling and McKim 2001).³

¹Among scholars of scientific communication, the invisible college has come to denote the “gatekeepers for the field,” that is, “the informal body of scholars who are active in a field, determine its direction and control the channels of information distribution, including journal editing, peer review, and proposal evaluation” (Cohen 1996, p. 42).

²Preprints had long existed as a means for communities of scientists to exchange papers after they were written but before they had been accepted for formal publication. The Internet and World Wide Web have enabled electronic archiving of preprints.

³Thus, the Computer Science and Telecommunications Board of the National Research Council recommends studying “the concept of publication” by “various stakeholder groups in response to the fundamental changes caused by the information infrastructure,” adding that “the public policy implications of a new concept of publication should also be determined” (CSTB 2000, p. 206).

Note in this regard that (1) the present study does not interpret the concept of publication but instead reflects usage of the term by the various researchers cited, and (2) that these definitions differ among investigators.

Self-publication is one challenge to established scholarly publishing afforded by the new technologies. Specifically, informal publication through self-posting to websites or to large databases of technical papers, might—while increasing the flow of information, particularly in fields where access to the most current information is prized—inhibit formal publication, which is necessary to exposure among peers, promotion, tenure review, and, generally, career enhancement (Kling and McKim 1999, p. 893).

Electronic journals, too, are challenging accepted procedure in the scientific journals publication process. Estimates vary, but as of this writing, the number of “e-journals”—i.e., electronic, or online, journals—ranges from about 3,200 to 4,000; these are in a variety of formats including online versions of print journals, journals found only in an electronic format that largely replicates the structure of print journals, and online journals that attempt to create an entirely new mechanism of communication.⁴

Concurrent with developments in information technologies have been profound changes in the scholarly publishing arena itself. These include a consolidation of smaller publishers into large commercial enterprises that bring out scholarly journals as part of a total portfolio. These publishing houses tend to be interested in bottom-line profitability and in issues of copyright and rights of first publication; their subscription policies have evoked a sense among some scholars and librarians that there is something unfair in the pricing.

SCOPE OF THIS EFFORT

With the expansion of the Internet/World Wide Web, great attention has been focused on the traditional publication processes, changes to business models, implications for intellectual property rights, and modes of communications. This study consequently examined the recent literature on information technology and scholarly journal publication to characterize the impact of the Internet/World Wide Web on the nature, function, and status of scholarly journal publishing in the last decade. The study focused primarily on the peer-reviewed

journal article, since this “marks the entry of information into the formal domain” (Griffiths 1990, p. 42) and because the peer-reviewed journal article is and has been for at least two decades “the most extensive mode found in the published literature and represents the greatest amount of resources” (King, McDonald, and Roderer 1980, p. 7). This study is *not* a discussion of the whole process of scientific communication, but instead an examination of a subset of that process: scientific journal publishing and how it may have been affected by the new information technologies. This primarily entails discussion of the e-journal.⁵

To characterize and evaluate the status of the formal, refereed literature, five questions have been posed:

1. What issues arise from the literature?
2. How do information scientists measure “impact,” or implications or effects?
3. Have changes in researchers’ behavior been discerned?
4. What are the implications for underserved populations in the United States or abroad?
5. Are information security (that is, how systems and data are protected from unauthorized use) and user privacy investigated?

This effort covers, as noted, juried periodical articles, with a lesser reliance on chapters in anthologies, and monographs as well as conference proceedings, dissertations, and reports from the “grey literature”⁶ together

⁵Other forms of electronic communication, aside from the e-journal, are themselves the subject of serious study (see, for example, Carley and Wendt 1988, 1991; Cohen 1996; Finholt and Olson 1997; Olson, Finholt, and Teasley 2000; Walsh and Bayma 1996, 1997; and Walther 1996). These communication modes (e.g., e-mail, listservs, etc.) are described in this study only as they compare to, contrast with, and augment the traditional peer-reviewed journal article.

⁶“The Grey Literature Page” on the New York Academy of Medicine website (<http://www.nyam.org/library/greylit/index.shtml>) cites the definition of grey literature generated at the Fourth International Conference on Grey Literature held in Washington, D.C., in October 1999: “that which is produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers.” It goes on to characterize grey literature publications as “nonconventional...and sometimes ephemeral [these] may include, but are not limited to the following types of materials: *reports* (pre-prints, preliminary progress and advanced reports, technical reports, statistical reports, memoranda, state-of-the art reports, market research reports, etc.), *theses*, *conference proceedings*, *technical specifications* and *standards*, *non-commercial translations*, *bibliographies*, *technical and commercial documentation*, and *official documents not published commercially* (primarily government reports and documents).”

⁴Although it is widely agreed that the number of online journals is growing rapidly, there is surprising disagreement regarding the definition of an electronic journal; how electronic journals compare with print journals; and what relationship the formal peer-reviewed article bears to other forms of electronic communication. These issues are discussed more fully in the “Findings” section.

with limited consultation with experts. All of these materials are in English⁷ and are primarily from U.S. sources. Attention has been concentrated on the period since 1994, the point at which the expansion of the Internet and proliferation of communication technologies appear to have intensified discussion of the future of

scholarly publication, particularly in the sciences. Hitchcock, Carr, and Hall (1998b); Peek and Pomerantz (1998); and Tenopir and King (2000) provide synopses of work in this area up to 1995. Sources and methods are discussed in greater detail in the next section.

⁷Russak (1975) declared that English had become the universal language of scientific communication in post World War II Europe; Buican and Amador (1991) concur, citing the use of “International English” to facilitate global communication among technical and non-technical audiences. Nonetheless, interesting work is clearly being undertaken by non-English speakers, and the resulting research is not necessarily being published in English.